The Ballarat Naturalist

June 2019

Ballarat's golden mining history and current explorations

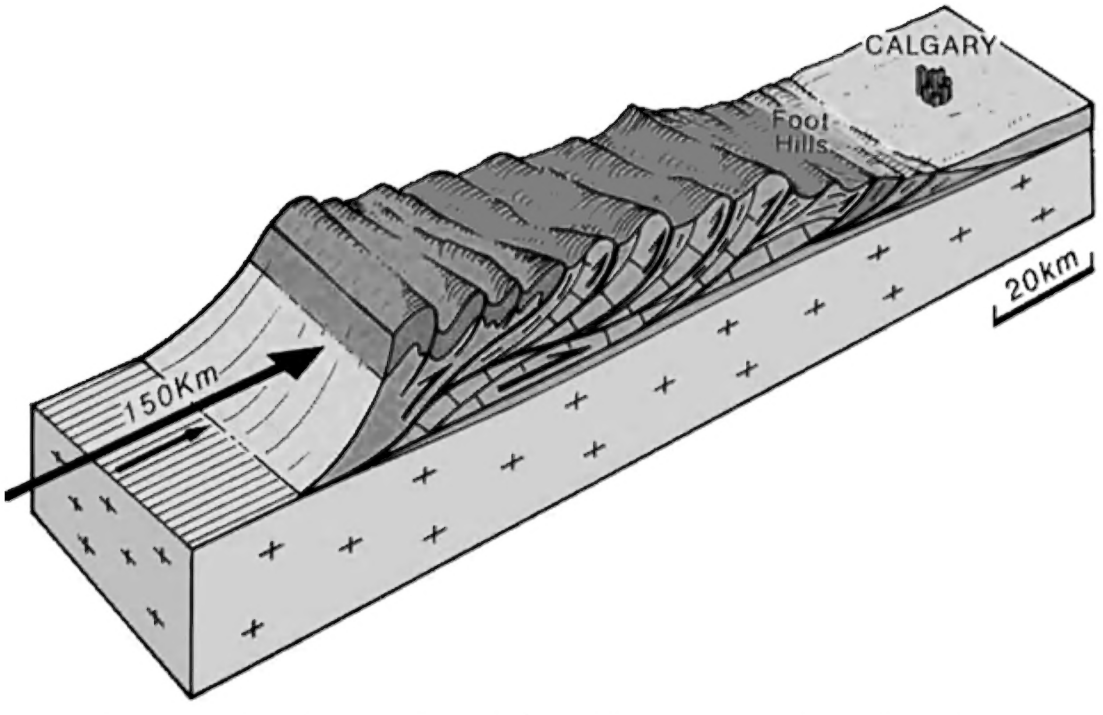
From a presentation by **Bill Reid**

Our invited speaker at the Club's May meeting was Bill Reid, exploration geologist with international mining and teaching experience. Bill is now the Exploration Manager for Castlemaine Goldfields Pty Ltd, which has operated the Ballarat Goldfields since purchase of the mine from Lihir Gold in 2010. The current mine (Lion-Gold) employs 200 staff and contractors.

Today's surface facilities, surrounded by Ballarat

[Note that all images are from a slide presentation by Castlemaine Goldfields Ltd. and no responsibility is taken by the company with regard to the use of the images by others.]

The presentation covered a wide range of topics and terms, including the Orogenesis or ‘mountain forming’, and the Ordovician (458 million years ago) background to the gold-bearing Ballarat reef quartz that is heavily folded and faulted and creates folds and faults. This process heats up rocks and ‘sweats’ out fluids – which follow faults – and form ore deposits.



Orogenesis – Mountain building (An example from Canada)

Some mining terminology was peculiar to Ballarat - such as ‘leather jackets’, ‘indicators’ (thin seams in strata) and ‘lines’, used by early miners. Understanding the meanings of these colloquial terms is essential in interpreting the extensive old records.

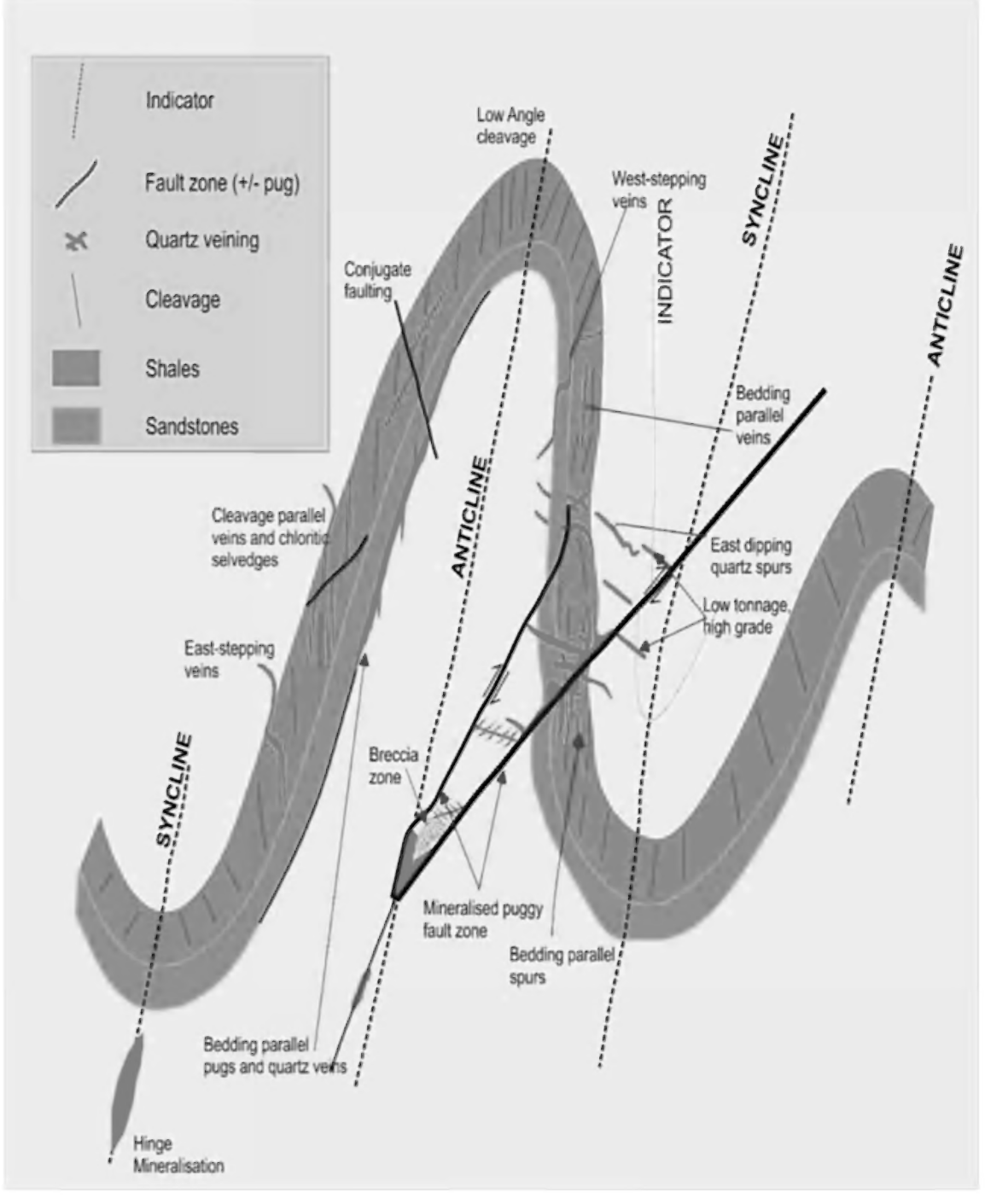
From the early 1850s until the last mine of that era closed in 1918, over 3 million ounces of gold were mined from the approximately 2000 reef mines of Ballarat. The reason for the closure of those early mines was seldom a lack of gold. Mine closure was invariably caused by factors such as changes in gold price or in wider investment market, high cost of controlling water in mines, mine disasters, political events and development of other goldfields such as Kalgoorlie.

Common terms in Ballarat Mining

Leatherjackets are west-dipping faults, found associated with all reef mineralisation

Indicators are thin geological units, associated with 11% of the total gold recovered from Ballarat.

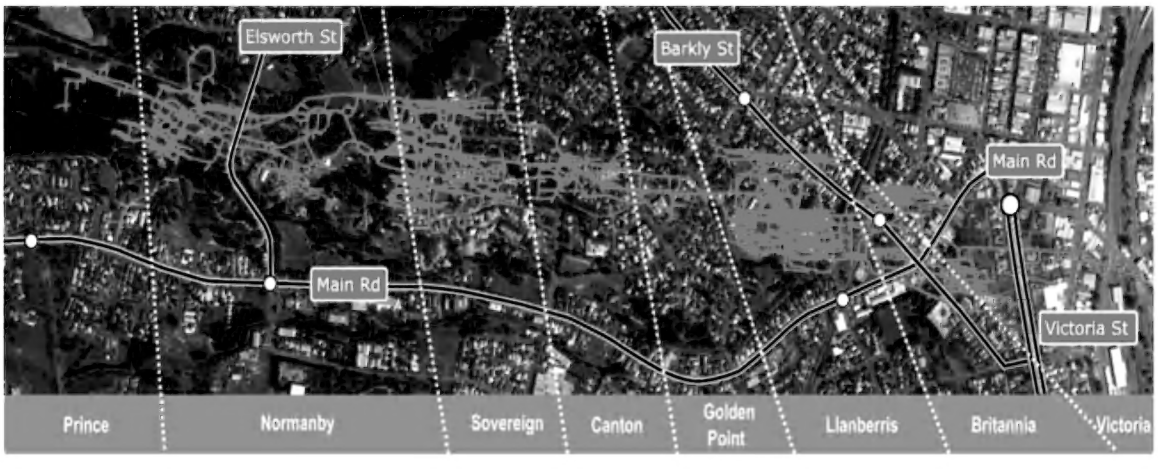
Lines are the limb of a fold (U-shaped or A-shaped) that is known to host gold



The lack of manpower during World War I had a major impact on closures. Mining records from that era have become a vital resource today in planning mining operations. In the case of Ballarat's gold-fields, records of the locations of rich gold extraction sites and the timing of mine closures have provided provide valuable clues to finding potential areas for future exploration. The location of high yielding shafts that were closed for reasons extraneous to gold yield can provide clues to areas of high potential future yields of gold.

Map above shows leases for Ballarat Goldfields (black lines) over-lain on streets of Ballarat. The red is old deep lead mines and orange is leads. The green is basalt and white is ordovician areas.

Bill described how expansions to the Ballarat Mine are planned by combining historical records of depths and gold extractions, with modern sampling and assay methods to develop 3-D models of potential yields. Gold reserves are far from exhausted and the current mine has 42 km of workings under Ballarat East. Work is mainly up to a depth of 750 m, well below the majority of the historic mines (up to 300 m).



The map above was provided (unconventionally) with 'south to the top' – so shows current mining activity running in an east-west line, on the south of Main Rd between the city and Mt Clear.

Deep leads are ancient river alluvium that miners followed beneath basalt layers. Bill also compared the mining techniques between the 19th Century mines and the present day. Vast changes in technology have occurred, e.g. one pump may now dewater large volumes of water, whereas historically, mines struggled to manage the water with many pumps. Air ventilation was another major safety problem to be overcome by early miners, that resulted in a lot of friction between mines.

Bill also commented that it is very unusual for a mine in Australia directly under a city not to be dominated by its mine - like Broken Hill or Mt Isa - where most of the population is involved in mining. He has found that Ballarat people are very positive and encouraging about the Ballarat mine. However, some Ballarat residents have little knowledge of the working mine, while many visitors assume that the small underground mine exhibitions at Sovereign Hill comprise the only current mine workings.

It was particularly interesting to learn how the historic mining records, supplemented with modern technologies and drilling and testing results, are incorporated into 3D modelling of the old adits, and have been crucial in leading Ballarat Goldfields to valuable gold reserves.

Bill was an excellent and entertaining speaker who gave a most enjoyable talk. Unfortunately some valuable mining records were lost after closure of the Ballarat School of Mines, and the speaker appealed to members to look out for such valuable data.

Somewhere, perhaps, a shoebox full of old maps and plans or documents is waiting to be found in a garage or cupboard. Such a 'Holy Grail' is not on-line and is not curated.

John Petheram

Excerpts from Club Meeting held May 3, 2019

Opening and Apologies

Attendance: President John Gregurke welcomed 30 attendees, including 7 visitors.
Apologies: Anna Baulch, Les Hanrahan, Fran Hanrahan, Bill & Kathy Elder, Margaret Rich, Mark Moravec, John Morrish, John Mildren, Bill Murphy, Eric and Joan Reynolds, Helen Young-Harvey, Sophie Akers and Sully Horwood.

Minutes of Club Meeting- April 5, 2019

Accepted as a true & accurate record
Moved: A. Arnold Seconded: B. Cheesman Carried.

Business Arising from Correspondence

The April issue of Community Conversations noted that Expressions of Interest are now sought to join the Stakeholder Reference Group to support the Chief Conservation Regulator. If someone would like to represent FNCB on the reference group, please get in touch with Emily.

FNCV membership renewal now due. Emily and Kathy to arrange renewal.

Woowookarung invertebrate report by Freya Fogliani & Penny Greenslade, Fed. University: next step requires a volunteer to come into Fed Uni and sort out the mixed samples of animals that have been counted and identified to order and make a voucher collection of morphospecies, with Penny's help. If someone is interested and available, please get in touch with Emily.

Emily has joined the FNCV's Australian Natural History Medallion General Committee as the FNCB's representative.

Reports:

Treasurer's Report:
Opening bal: $8,673.22
Income $263.00
Expenses $208.67
Closing bal: $8,727.55

Moved: E. Noble Seconded: J. Petheram Carried.

Planned burn at Woowookarung Regional Park in April 2019: In the opinion of several field naturalists that have visited the burn area since the burn, it was a hotter-than-hoped-for "cool" burn. John G. took a before photo from a particular spot so that he can photographically capture the changes post-burn over time.

Temperate Woodland Bird Conservation Action Plan (CAP) workshop at Clarkesdale Bird Sanctuary, April 30: Emily reported that 18 people involved in the history, present and future of Clarkesdale attended this productive workshop hosted by BirdLife Australia, including three members of FNCB, working to establish a strong position for the Sanctuary in the implementation of the CAP on ground, through habitat protection, restoration, education and research.

Lake Burrumbeet Futures partners- Planning Meeting: John G. reported that DELWP presented a summary of responses in the "Lake Burrumbeet Futures" surveys to the project partners: 600+ respondents. Both the natural environment & recreational activities showed up as values of Lake Burrumbeet that were appreciated by the community and therefore will guide future management. Thanks to FNCB members who completed the survey.

General Business

The FNCB's June outing on Sunday June 9 is a joint event with Ballarat Environment Network (BEN) members thanks to a Biodiversity On-ground Action grant funded by DELWP. It includes an indoor workshop with FungiMap mycologist Sapphire McMullan-Fisher on the use of FungiMap, the sort of information that can be accessed through it, and how to upload fungi records to it. This will take place at the Smythesdale Community Hub known as "The Well", 19 Heales St, Smythesdale from 10am. We will then head to the BEN-managed reserve, Grams Road Reserve, Smythesdale for a BYO picnic lunch and a fungi foray, giving us the opportunity to practice using FungiMap.

Rob S. informed members of Ballarat City Council's plans to remove and replace ten oaks and elms in Eyre St due to lack of structural integrity.

Show & Tell (Field Reports)

Emily noted that two Australasian Grebes returned to her wetland in Scarsdale within a couple of days of each other last week, after an absence of about four months.

Wayne observed a Sea Eagle, Little Eagles and possibly a Wedge-tailed Eagle over Lake Burrumbeet.

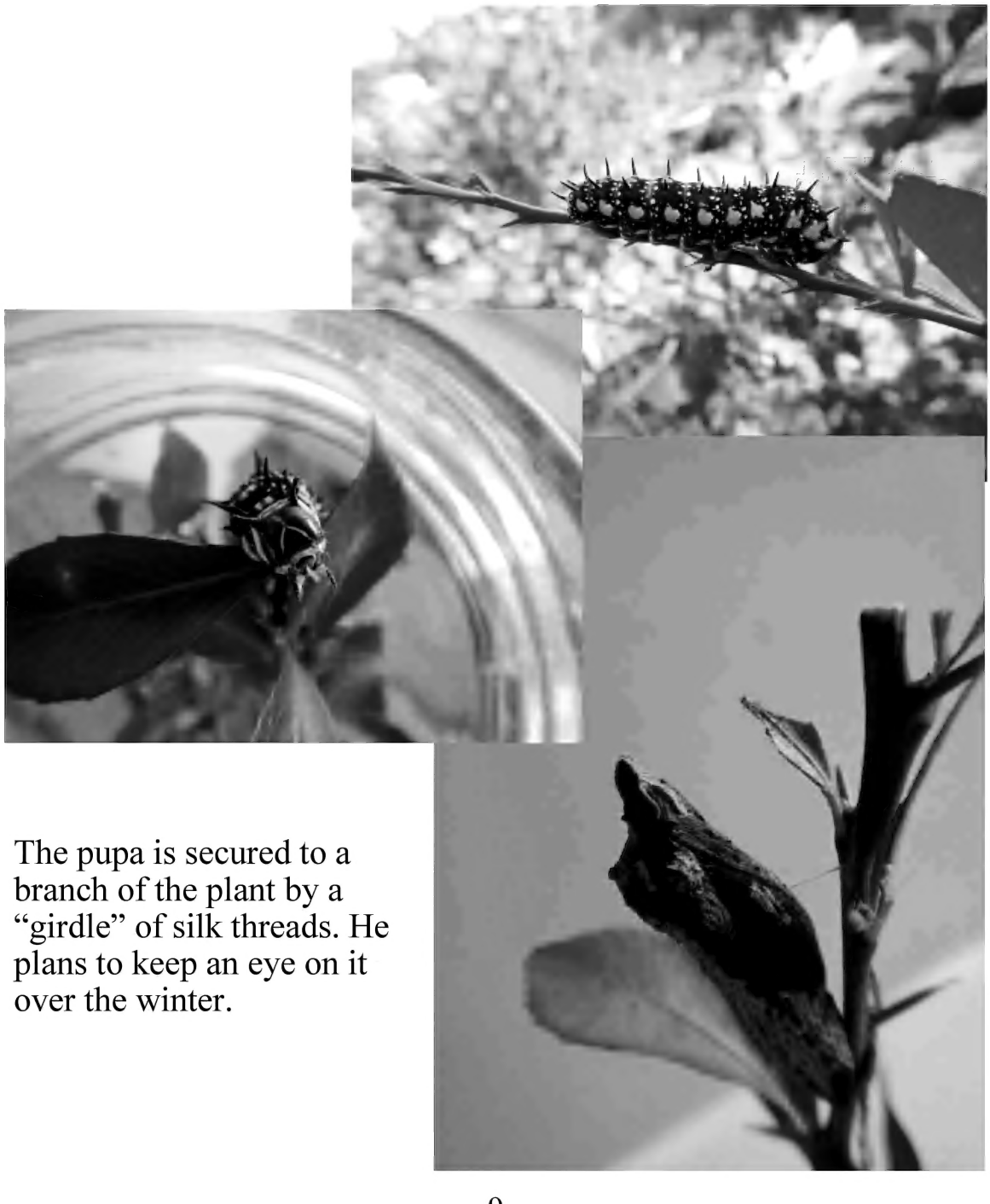
Carol spotted an Intermediate Egret and an Australian Darter at Fairyland, Lake Wendouree on May 2.

Show & Tell/ Field Reports—continued

Andrew G. found lots of Noisy Friarbirds and Wattlebirds in the Yellow Gums at Deep Lead.

Peter N. described the sight of two majestic Wedge-tailed Eagles gliding just above his car and landing on a log in the paddock next to where he had parked in Happy Valley.

Andy reported finding two larva of Dainty Swallowtail Butterfly (*Papilio anactus*) feeding on a planted Native Finger Lime (*Citrus australasica*) in his Alfredton garden. One larva disappeared, but the other went on to pupate.



The pupa is secured to a branch of the plant by a "girdle" of silk threads. He plans to keep an eye on it over the winter.

Have a say in River Management and future decisions about the Barwon.

The Barwon Ministerial Advisory Committee is holding a series of workshops to seek information and views from the public about management of water resources into the future, entitled "Looking after our rivers".

June offers three opportunities to have your say:

June 11 Mt.Clear 7-9 pm	Earth Ed Centre, Olympic Ave.
June 12 Meredith 7-9 pm	Royal Hotel 20 Wallace St
June 13 Bannockburn 7-9 pm	Bannockburn Cultural Centre 27 High St

The Barwon is a big system. The Leigh and the Moorabool flow into it, and wetlands and aquifers are as important as the flow in the river itself. It's a country river and a city river. Urban areas a re expanding and there is less water around.

Join us for discussion through the catchment, then three Pressure Point workshops, to work out what needs to be improved, in the river and in its management. A Discussion Paper will then propose how institutional arrangements can be improved.

In September, join in again to say what you think about these options, before the Ministerial Advisory Committee makes its recommendations to the Ministers for Planning and Water.

Key questions you might want to ask or provide answers to are:
What's important to you?

What's getting better?

What needs improving?

What should be in place by 2030?

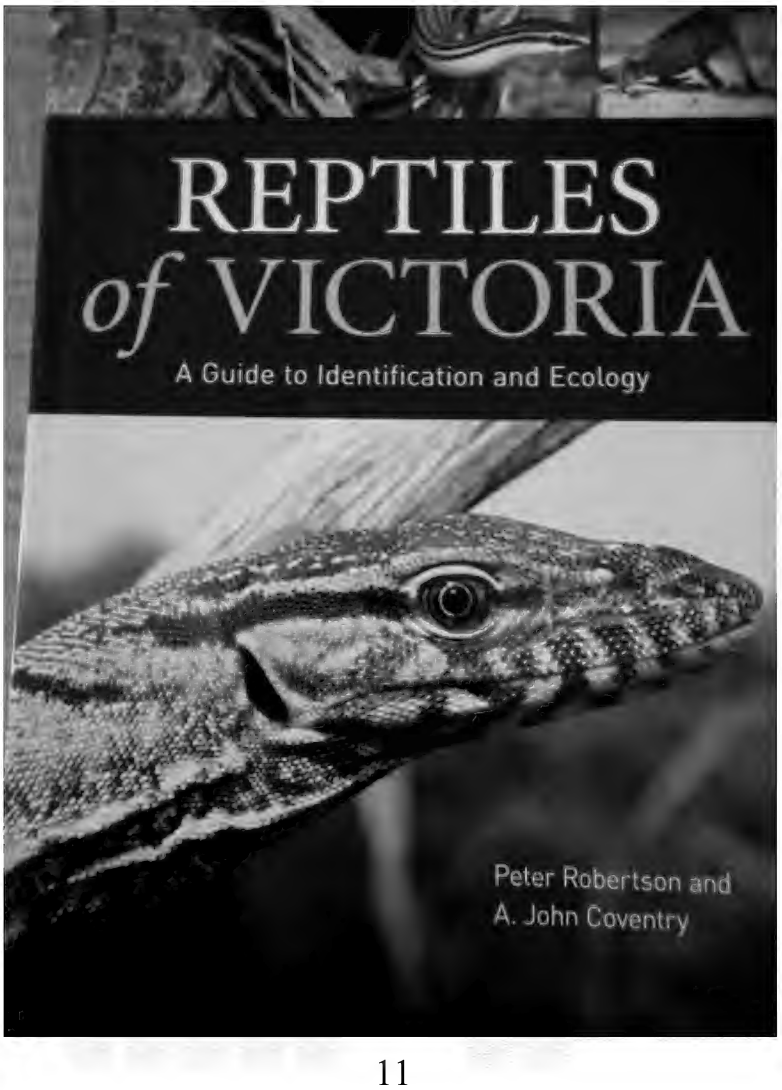
Book Review

"Reptiles of Victoria: A Guide to Identification and Ecology"

By Peter Robertson and A. John Coventry CSIRO Publishing 2019

What a rare treat it is when an outstanding book on Australian reptiles is published, especially when it has been authored by two of Australia's finest herpetologists. For the local field naturalist it is even more exciting because the book focuses on Victoria's diverse range of reptile species. I cannot profess to be greatly knowledgeable about reptiles but it is a delight to find a book that will appeal both to the experts, and the interested naturalist who perhaps lacks a detailed knowledge of the subject.

As the Introduction states. "This book is the first publication to include all of the reptiles known to occur within Victoria" In all, 123 native, introduced and vagrant reptile species are covered. It replaces an earlier book by the same authors, "The Snakes of Victoria" published in 1991. Sadly before all the work to publish the book was completed, John Coventry died in 2007. John was Senior Curator of Herpetology at the National Museum of Victoria (now Museums Victoria), a position he held for nearly 50 years.



Peter Robertson is an experienced field ecologist who runs an ecological consultancy and has conducted and coordinated research into the management of species of reptiles and amphibians.
The book has notes on various aspects of the biology and ecology of each species of Victorian reptiles but also has some amazing photographic images with the clarity that greatly enhances field identification. The photos taken largely by Peter Robertson reveal his skill as an accomplished photographer.

The book commences with an outline of the basic biology of reptiles and is followed by a description of biogeography, Victorian habitats and distribution, well-illustrated with maps and photographs of the main habitat types and text describing vegetation and some of the main species of reptile found in each vegetation type. As a preliminary to launching into a very full description of the reptile fauna of Victoria, there is a neatly basic and succinct chapter on taxonomy – describing the classification and evolutionary relationships of the species.

From here on the book's chapters follow a classification-based layout starting with a comprehensive listing grouped by Order and Family under which, species are listed and accompanied by the page number reference to facilitate your ability to rapidly access the key information.

Each Order section is highlighted by using fawn coloured pages and the same system is used to separate sections on Lizards and Snakes. This helps greatly with quickly navigating through the book to find what you may be looking for. Fawn print backgrounds also draw your eye to the numerous dichotomous keys embodied in each section. The keys are simple to understand especially when used in conjunction with the excellent glossary of terms located at the back of the book. Keys are provided for separating the two Orders found in Victoria; the Testudines (Turtles and Tortoises) and the Squamata (Lizards and Snakes). There are keys to all the families and to separate genera and individual species when required.

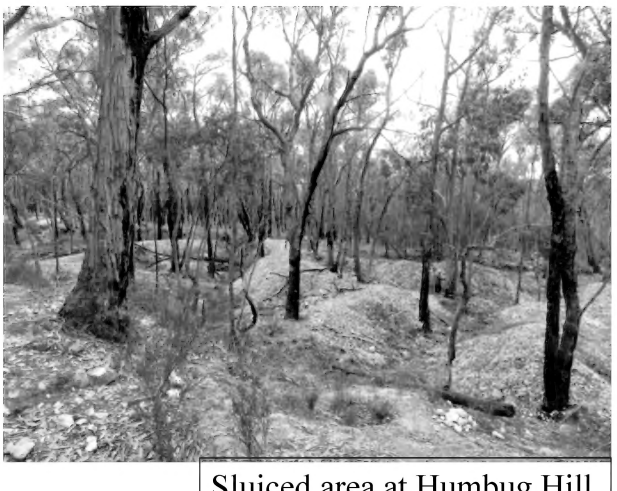
Individual species descriptions follow a standardised layout with sub-headings on Identification, Distribution and habitat, Biology and Recent synonyms (this demystifies the problems with common names especially when there are regional differences). A very useful section is Similar species which may alert you to any possible faulty identifications when species appear superficially similar. The Status of the species as it currently stands is provided based upon the Victorian criteria. One of the best features of this layout are the distribution maps which in many other publications are often hard to interpret. The maps in this book have a very clear background based upon a public land underlay printed in a darker green and the names of some of the major towns to give a readily relatable regional context when you are out in the field.

There is a brief mention of a few Victorian alien species with photographs. To conclude there is a page summary of the key points you need to know about First Aid for snake bite. There is a section on Victorian Wildlife regulations with internet addresses to Victorian, Federal and interstate agencies. There is a useful glossary and a comprehensive Selected Bibliography grouped conveniently under the headings General, Turtles, Lizards and Snakes. Fittingly the book concludes with an index to common names and general terms. Near the end of the book there is a wonderful photo of a group of herpetologists including the authors sitting around a campfire in the Victorian Big Desert with a camp oven prominent in the foreground. This will appeal to most field naturalists and probably leaves no doubt about the combined 'field experience' of the authors and the many people they acknowledge that have contributed to this excellent book.

I have yet to really get to grips with this book by using it as a field-guide but I am eagerly looking forward to next spring's possibilities. As one who has always enjoyed touring, camping and walking in Victoria's Mallee, I am sure this book will be an essential part of the gear I take on such journeys in future. My copy came from Andrew Isles, signed by the author and with a nice bookmark with a gecko illustration by artist William T Cooper. FNCV also will supply the book from its Bookshop contact Kathy at bookshop@fncv.org.au and if you happen to be an FNCV member there will likely be a discount which helps offset postage costs.
Review prepared by Andy Arnold, May 2019

Geology of Slaty Creek area excursion 4 May 2019

The excursion began at Slaty Creek picnic ground. Wattle Flat Pootilla Landcare Group obtained a grant from RACV to plant indigenous trees and shrubs and erect an interpretation sign. One side shows a mosaic of flowering plants found in the area. The other side has block diagrams explaining the geology of the area over the past 500 million years.
The geological information was supplied by FNCB member, David Horwood, who lead the interesting excursion.
(continued p15.)



Sluiced area at Humbug Hill

Along the Midland Highway we stopped at a roadside cutting to inspect the exposed Ordovician rock. The layers of sedimentary rock had been folded into a syncline and an anticline with quartz veins. We returned to Humbug Hill in Creswick Regional Park. On the top of a hill we saw an area of White Hills Gravel that had been sluiced to recover nuggets of gold. Great effort would have been required to pump water up the hill to remove the gravel and clay. The quartz cobbles remain in piles. Another sluiced area along Slaty Creek Road showed channels had been cut through sandstone to direct the flow of water.

Our lunch stop was at St Georges Lake. At Portuguese Pit gold mining has formed a steep-sided pit about 10 metres deep. The walls showed the colluvium that had been deposited within the last 2 million years.

Field nats at Portuguese Pit.

In the afternoon we travelled north of Creswick to view some of the hundred eruption points which produce lava to fill the ancient drainage lines during the last 5 million years. We stopped at the old concrete bridge built by Sir John Monash in 1899-1900. The bridge is now deteriorating and has a two tonne load limit. On the southern side the road cuts through basalt. Many mullock heaps were seen following the deep leads below the basalt.

Our final stop was overlooking a basin near Clover Hill. Basalt moved upwards and contacted underground water causing a violent eruption and volcanic debris was scattered around the rim. This is known as a maar. Hepburn Lagoon near Smeaton is another maar.

Wall of colluvium at Portuguese Pit.

Thanks to David for leading an informative excursion. At each site he explained the geological processes that have occurred to form the landscape we see today.

John Gregurke

CALENDAR 2019

June

Fri 7 Wildlife of the Otways & Shipwreck Coast
Grant Palmer, Federation University

Sun 9 Fungal Foray at Grams Rd. Reserve, Smythesdale
Sapphire McMullan-Fisher, Fun Fungi Ecology

July

Fri 5 Basic Insect Identification, Bill Elder FNCB

Sun 7 Waterfalls of Hepburn shire, John Gregurke FNCB

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Meetings are held at Federation University Gillies St Campus on the first Friday of the month at 7.30pm.
Excursions: Leave from the carpark of Federation University Gillies St Campus at 9.30 am, unless otherwise advised.

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